

KANSAS DEPARTMENT OF TRANSPORTATION



PAVEMENT MARKING POLICY

January, 2002

KANSAS DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY OF TRANSPORTATION

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Secretary of Transportation

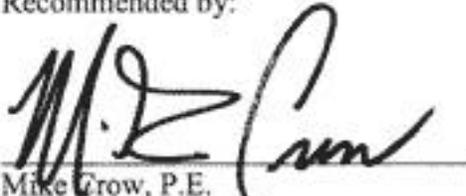
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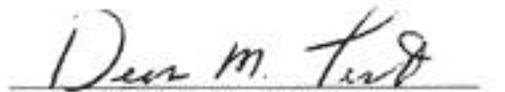
CERTIFICATION

Pursuant to the power and authority granted to the Kansas Department of Transportation by the laws of the State of Kansas as set forth in K.S.A. 68-404, I, Warren L. Sick, Assistant Secretary and State Transportation Engineer, for the Kansas Department of Transportation, do hereby certify that I have examined and approved the contents of the Kansas Department of Transportation "Pavement Marking Policy". I hereby declare that the Kansas Department of Transportation officially adopts this "Pavement Marking Policy" for the State Highway System, effective January, 3, 2002 which replaces the Kansas Department of Transportation Pavement Marking Policy dated September 1, 2000.

Recommended by:

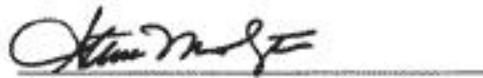

Mike Crow, P.E.
Chief of Traffic Engineering

12/17/01
Date

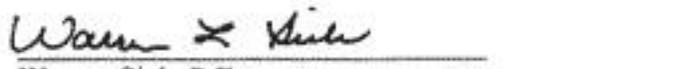

Dean Testa, P.E.
Chief of Construction and Maintenance

12/27/01
Date

Approved by:


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Director of Operations

12/28/01
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Warren Sick, P.E.
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12/31/01
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KANSAS DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING POLICY

PURPOSE:

This policy provides guidance in the selection of pavement marking materials for projects on the Kansas State Highway System. The intent of this policy is to provide designers and others engaged in the selection of pavement marking materials with selection criteria based upon demonstrated product durability, retained retroreflectivity, daytime presence, color conformity, and product cost history.

APPLICABILITY:

The procedures and assumptions contained within this document are intended for KDOT projects only and shall not be construed as an endorsement of one product over another. The projected service lives tabulated in this policy are derived from demonstrated performance on Kansas projects or from manufacturers' warranty information and should not be taken as a guarantee of any product's level of performance in any specific environment.

AUTHORITY:

This policy was developed by the KDOT Pavement Marking Advisory Committee, which was created by directive of the Assistant Secretary of Transportation and State Transportation Engineer.

DEFINITIONS:

Retroreflectivity: The ability of a material to reflect incident light back to its source (generally vehicle headlights). Retroreflectivity is expressed in the SI system in millicandelas per square meter per lux [(mcd/m²)/l] or in the English system in millicandelas per square foot per foot-candle [(mcd/ft²)/fc].

Average Useful Retroreflectivity: The average amount, during the service life of an installed line, by which the line retroreflectivity exceeds 150 mcd for white or 100 mcd for yellow.

Brightness Benefit Factor (BBF): A number, expressed in units of millicandelas-years per dollar-meter, which combines a product's average useful retroreflectivity, durability, and cost per unit length. The BBF is used to compare pavement marking selection alternatives with different lives, reflectivities, and cost. In general, the product with the highest BBF should be considered first on any given project.

Road User Costs: Costs borne by the driving public that are associated with a single installation of pavement markings. These costs consist of increased vehicle operating expenses and lost wages due to extended driving times through the construction work zone and are incorporated into the cost element of the BBF calculations in Appendix B.

Service Life: The time from the installation of a material to the time replacement is justified. Pavement markings should be replaced when the material:

- 1) Shows a loss of retroreflectivity such that its average reading on a Mirolux-12 retroreflectometer or other approved retroreflectometer falls below 150 mcd for white and 100 mcd for yellow **or**
- 2) Becomes detached from the roadway due to adhesive failure **or**
- 3) Suffers a loss of pigment such that it no longer provides effective daytime lane delineation.

Long-life Markings: Markings who's demonstrated service life will extend over a period of more than one year.

WARRANTS

LONG-LIFE PAVEMENT MARKING MATERIALS

Long-life pavement marking materials should be considered when one of the following warrants are met:

1. Major Modification projects where the construction year average daily traffic (ADT) is equal to or greater than 5000 vehicles per day (vpd). Funds will come from the Major Modification Program.
2. Major Modification projects where the construction year ADT is less than 5000 vpd and Substantial Maintenance: Interstate Resurfacing and Non-Interstate resurfacing projects. Funds will come from the Pavement Marking Set-Aside Program.
3. Priority Bridge Program bridge replacement / redecking projects. Funds will come from the Pavement Marking Set-Aside Program.
4. City connecting link projects when the ADT is equal to or greater than 5000 vpd or when the speed limit is equal to or greater than 70 km/h (45 mph). Funds will come from the project-funding category.
5. Where pavement markings create median islands, channelization islands, or two-way left turn lanes on either the rural highway system or city connecting links. Funds will come from the project-funding category.
6. When recommended by a traffic engineering study. Funds will come from the Pavement Marking Set-Aside Program.
7. When recommended in the KDOT Pavement Marking Maintenance Policy, which appears in Appendix F of this document. Funds will come from the Pavement Marking Set-Aside Program.

Note: Pavement marking projects should be extended, as necessary, so that transitions in material types are logical (e.g., two road sections with long-life markings that are in close proximity should not be separated by a short section of road with shorter-lived markings).

PLOWABLE RAISED PAVEMENT MARKERS (RPMs):

Snow plowable raised pavement markers may be provided on existing or new state highways and expressways when one or more of the conditions below are met. In general, RPM's are not to be used on freeways or multi-lane divided expressways with interchanges. They may be considered in special situations where their use would be beneficial because of unusual geometrics or safety concerns.

1. Those locations that have a history of or develop a pattern of nighttime accidents that, according to engineering judgement, could be alleviated by RPM's
2. When lighting is needed at an intersection, as determined from the lighting policy, RPM's may be installed in lieu of lighting. These may be locations where power is not readily available, and the remaining service life of the pavement is at least three years.
3. When the ADT, for a section of roadway, is over 3000 and the number of trucks is above 450 vehicles/day. The remaining service life of the pavement is at least 6 years. Consistency along a route and logical terminal points will be considered.

LONGITUDINAL LINES

MATERIAL SELECTION METHODOLOGY FOR LONG-LIFE MARKINGS

1. In Appendix D, find the table corresponding to the remaining service life of the surface being considered. If there is some uncertainty regarding the remaining life of the surface, consult Appendix E, "Expected Pavement Surface Lives", for guidance. Next, locate the column for the ADT class of the roadway. The material with the highest Brightness Benefit Factor (BBF) will represent the best combination of durability, retroreflectivity, and cost and should be selected for that project if there are no other factors influencing this decision.
2. Factors that may influence this selection include exposure of pavement marking crews to traffic, construction sequencing, disruption of traffic, the need to place paved shoulders or earthen wedges after the edge lines are embedded, or the ability of the maintaining jurisdiction to maintain one type of marking material more effectively than another.

NOTE: Different materials may be used for different line types, if necessary, e.g., patterned cold plastic centerline with epoxy edge lines.

TRANSVERSE MARKINGS AND SYMBOLS

Careful consideration should be given to the selection of the materials used for transverse markings and symbols due to the high shear and abrasion present in the areas on which some of these markings are placed, the importance of the information provided by these markings, and the detail work that placement of these markings demands. In general, a pavement marking material should be matched to the anticipated service life of the pavement surface onto which it will be applied as well as the material used for the longitudinal lines. See Appendix A, Pavement Marking Material Characteristics, for more detailed guidance on material service life.

MARKING TYPE	CONCRETE	ASPHALT
Crosswalks & Stop Lines	High-Durability Tape or Preformed Thermoplastic	High-Durability Tape or Preformed Thermoplastic
Arrows, Legends, and R/R Symbols	High-Durability Tape or Preformed Thermoplastic	High-Durability Tape or Preformed Thermoplastic

Notes: The above table assumes that existing pavements are in good condition.

Paint should be used on pavements that show a polished surface. Preformed thermoplastic has also shown some ability to adhere to polished surfaces.

Railroad crossing pavement markings on new concrete pavement surfaces should normally be High Durability Tape.

APPENDIX A: PAVEMENT MARKING MATERIAL CHARACTERISTICS

LONG-LINE MARKINGS:

PAVEMENT MARKING (PATTERNED COLD PLASTIC):

A preformed tape with a plastic backing and a "waffle-patterned" surface that should provide a service life of six (6) to eight (8) years, depending on traffic volumes. The initial retroreflectivity of white patterned cold plastic markings is approximately 1100 mcd. The material is generally used on higher traffic volume roadways but can also be used on lower volume roads. KDOT specifications require the contractor to grind a groove 1.0 mm (40 mils or approximately the thickness of a dime) deep and apply the patterned cold plastic pavement marking material onto new or existing concrete surfaces and SM-1T bituminous surfaces in accordance with the manufacturer's recommendations. On other new asphalt surfaces, patterned cold plastic must be inlaid into the freshly rolled mat. Because of this inlaying requirement, the contractor will have to use care in building up turf wedges or laying paved shoulders if this material is specified as an edge line. At the end of its useful life, this material will have to be removed (generally by grinding) prior to installation of new markings. This material will only be used by KDOT for 150mm lane lines on four lane divided highways.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 m width line (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	8	1100 / 800	328	7.06	7.06
5-50	6	1100 / 800	559	7.06	7.06
>50	5	1100 / 800	559	7.06	7.06

- NOTES:
- a: This term is introduced as T_s , Service Life, in the BBF computation in Appendix B
 - b: This term is introduced as R_u , Average Useful Retroreflectivity, in the BBF computation in Appendix B.
 - c: Initial and interim installation costs include installation of new material, future removal costs, and temporary marking costs, without consideration of removal costs associated with a prior application.
 - d: Final installation costs include installation of new material. No subsequent removal costs are considered.

(c & d, above (as appropriate), enter into the Appendix B BBF computation as components of \$, cost per meter, as does road user cost.)

PAVEMENT MARKING (EPOXY):

A two-part material that should provide a service life of three (3) to five (5) years. The initial retroreflectivity of white epoxy markings is approximately 450 mcd. Epoxy markings may be used on all roadway classes. It may be renewed following a surface sand-or shot blasting of the underlying epoxy markings. Due to the extended setting time for epoxy pavement markings, which can, depending on temperature conditions, be in excess of 45 minutes, traffic control issues may be complicated and should be fully addressed prior to installation of this material. Epoxy pavement markings are available in fast-set and slow-set formulations.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	5	450 / 300	178	1.05	0.85
5-50	4	450 / 300	143	1.05	0.85
>50	3	450 / 300	142	1.05	0.85

PAVEMENT MARKING (Multi Component Special) (MCS):

A two-part material that can be Modified Urethane, Polyurea, Methylmethacrolate, or other special epoxy like markings that require a mix of materials to achieve a chemical reaction for formation and bond. MCS materials should provide a service life of four (4) to six (6) years. The initial retroreflectivity of white MCS markings is approximately 550 mcd. MCS markings may be used on all roadway classes. It may be renewed following a surface sand-or shot blasting of the underlying markings. Unlike Epoxy the setting time for MCS pavement markings is usually very short and can reduce the traffic control concerns. The Pre-Qualified List (PQL) will have the latest approved products for the material group.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	5	550 / 400	239	1.62	1.42
5-50	4	550 / 400	218	1.62	1.42
>50	4	550 / 400	218	1.62	1.42

- NOTES:
- a: This term is introduced as T_s , Service Life, in the BBF computation in Appendix B
 - b: This term is introduced as R_u , Average Useful Retroreflectivity, in the BBF computation in Appendix B.
 - c: Initial and interim installation costs include installation of new material, future removal costs, and temporary marking costs, without consideration of removal costs associated with a prior application.
 - d: Final installation costs include installation of new material. No subsequent removal costs are considered.

(c & d, above (as appropriate), enter into the Appendix B BBF computation as components of \$, cost per meter, as does road user cost.)

PAVEMENT MARKING (SPRAY THERMOPLASTIC):

A molten, sprayed thermoplastic material that should provide a service life of one (1) to two (2) years. The initial retroreflectivity of white spray thermoplastic markings is approximately 400 mcd. It is used primarily on low to medium volume roads with little turning traffic. It should only be used on asphalt pavement. Spray thermoplastic may be reapplied over an existing coat of spray thermoplastic or extruded thermoplastic with minimal surface preparation.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	2	400 / 300	125	0.64	0.64
5-50	N/A	400 / 300	N/A	0.64	0.64
>50	N/A	400 / 300	N/A	0.64	0.64

PAVEMENT MARKING (THERMOPLASTIC): Asphalt application

A molten, extruded plastic that should provide a service life of four (4) to seven (6) years. The initial retroreflectivity of white thermoplastic markings is approximately 500 mcd. It can be used on high or low traffic volume roadways but should not be used on Portland Cement Concrete Pavement (PCCP) under any circumstances. Thermoplastic may be reapplied over existing markings, however it may be advisable to reduce existing markings if a substantial amount of the original applied material remains.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	6	500 / 300	218	1.03	1.03
5-50	6	500 / 300	215	1.03	1.03
>50	5	500 / 300	200	1.03	1.03

- NOTES:
- a: This term is introduced as T_s , Service Life, in the BBF computation in Appendix B
 - b: This term is introduced as R_u , Average Useful Retroreflectivity, in the BBF computation in Appendix B.
 - c: Initial and interim installation costs include installation of new material, future removal costs, and temporary marking costs, without consideration of removal costs associated with a prior application.
 - d: Final installation costs include installation of new material. No subsequent removal costs are considered.

(c & d, above (as appropriate), enter into the Appendix B BBF computation as components of S , cost per meter, as does road user cost.)

PAVEMENT MARKING (Cementitious):

A concrete material that is grooved into the pavement and will provide a service life of ten (10) plus years. The initial retroreflectivity of white cementitious markings is approximately 650 mcd. The material is generally used on higher traffic volume concrete roadways but can also be used on lower volume concrete roads. Manufacturer specifications require the contractor to grind a groove 3.2mm to 6.4mm (1/8" to 1/4") deep and apply the material into the groove.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	10	650/500	191	11.70	11.70
5-50	10	650/500	191	11.70	11.70
>50	10	650/500	191	11.70	11.70

PAINT:

A sprayed, resinous material that should provide a service life of three (3) to twelve (12) months. The initial retroreflectivity of white painted markings is approximately 400 mcd, but it can drop below 150 mcd relatively quickly depending upon traffic volumes. It can be used as a maintenance marking material on any roadway class. New paint may be applied over worn painted lines without removal of the underlying material.

Tabulated data, as of Dec 2001, follow:

ADT Class (1000 vpd)	Service Life (yrs) (a)	Initial Retroreflectivity White/Yellow	Average Useful Retroreflectivity (b)	Cost of installed 100 mm width line: (\$/m)	
				(Initial/Interim) (c)	(Final) (d)
<5	1	400 / 300	96	0.25	0.25
5-50	1	400 / 300	96	0.25	0.25
>50	1	400 / 300	96	0.25	0.25

- NOTES:
- a: This term is introduced as T_s , Service Life, in the BBF computation in Appendix B
 - b: This term is introduced as R_u , Average Useful Retroreflectivity, in the BBF computation in Appendix B.
 - c: Initial and interim installation costs include installation of new material, future removal costs, and temporary marking costs, without consideration of removal costs associated with a prior application.
 - d: Final installation costs include installation of new material. No subsequent removal costs are considered.

(c & d, above (as appropriate), enter into the Appendix B BBF computation as components of \$, cost per meter, as does road user cost.)

INTERSECTION AND SPECIALTY MARKINGS

Due to the wide variation in locations where these materials are generally applied and the limited quantities used per project, statements relating to Service Life, Average Useful Reflectivity, and Cost are omitted.

PAVEMENT MARKING (HIGH DURABILITY):

A preformed tape with a plastic backing and a urethane topcoat. It is designed to withstand the shearing stresses of stopping and turning vehicles and should provide a service life of two (2) to three (3) years. In addition to glass beads for retroreflection, this material contains ceramic skid particles to provide an additional measure of safety for pedestrians and cyclists. The initial retroreflectivity of white high-durability markings is approximately 400 mcd. At the end of its useful life, this material will have to be removed (generally by grinding) prior to re-installation.

PAVEMENT MARKING (PREFORMED THERMOPLASTIC):

A preformed thermoplastic that is heated with a propane torch on site to liquefy and fuse the material to the road surface. The material should provide a service life of three (3) to five (5) years. The initial retroreflectivity of white preformed thermoplastic markings is approximately 350 mcd. It is frequently used as a maintenance material to patch existing thermoplastic lines and as a marking for high abrasion areas such as intersections, transverse markings and symbols. This material may be used on asphalt and on concrete surfaces. Depending on the manufacturer, a primer may be required for concrete surfaces. This material may be renewed by a subsequent application of new preformed thermoplastic material without removal of the underlying markings.

PLOWABLE RAISED PAVEMENT MARKERS (RPMs):

RPMs consist of a metal casting onto which a reflective strip or sheet is affixed so as to be protected from plow blades. The casting is secured inside a sawcut in the roadway through the use of epoxy or other adhesives. The reflector may be replaced if needed without removal of the casting from the roadway.

APPENDIX B: BRIGHTNESS BENEFIT FACTOR

The brightness benefit factor (BBF) is a benefit/cost ratio for pavement marking materials, representing the combined effects of a material's retroreflectivity, durability, and installed cost. The BBF is calculated from the following formula:

$$BBF = (R_a T_s) / S$$

Where:

- R_a** = Average useful retroreflectivity over the anticipated service life of the project.
- T_s** = Service Life
- S** = Average cost per unit length (meter). If the pavement marking material under consideration is not likely to last the full life of the surface, the cost of removal of the material (if necessary for a subsequent application of markings) is added to the installation cost, as is the cost of temporary markings. (Preformed tapes are, by KDOT specifications, required to be inlaid or tamped in immediately after compaction rolling, so temporary tape costs are avoided.). The cost to the public of lane shut-downs in lost wages and in increased vehicle operating costs (road user costs) is also included in the material cost, as is a 5% contract administration cost.

R_a is determined from the most current project experience and is calculated by taking yearly retroreflectivity readings on roadways representative of the ADT classification in which the BBF is listed. A sample calculation follows:

Consider a roadway with an ADT of 10,000 on which a 100 mm bituminous overlay (Design Life= 4 years) is planned. Experience indicates that a pavement marking material will cost \$3.00 per meter in place and last (time until retroreflectivity drops to 150 mcd for white) 5 years and that the yearly retroreflectometer readings for this ADT level will be:

750 mcd	At installation
400 mcd	At end of first year
300 mcd	At end of second year
250 mcd	At end of third year
180 mcd	At end of fourth year
150 mcd	At end of fifth year (incipient failure)

Assume that the material selected must be applied after the overlay has been completed. Consequently, temporary tape (cost = \$0.10 per meter of roadway on which long-life markings will be applied) must be used prior to the application of final markings. The road user cost for this application is \$0.28/m. (The road user cost is computed from the sum of the vehicle queue costs, work-zone delay costs, speed change costs, reduced work-zone speed costs, and queue-associated reduced-speed costs, by methods outlined in "A Model to Calculate the Road User Costs at Work Zones" (TTI, 1982), and updated using 1997 CPI transportation figures by QUEWZ-85, a software implementation of the TTI approach.

$$\text{Sum } R = (750+400)/2 + (400+300)/2 + (300+250)/2 + (250+180)/2 = 1415 \text{ mcd}$$

(Note that fifth year readings do not enter into the computation as any benefit extending past the design life of the roadway surface will be unrealized.)

$$R_{\text{average}} = 1415/4 = 354 \text{ mcd.}$$

R_u , the average useful retroreflectivity, is the amount by which the average retroreflectivity exceeds 150 mcd for white, therefore:

$$R_u = 354 - 150 = 204 \text{ mcd.}$$

$T_s = 4$ years (The lesser of the anticipated surface life or the marking service life)

$S =$ the sum of:

- the installed cost (\$3/m from problem statement)
- contract administrative cost (5% or \$0.15/m)
- temporary tape cost (\$0.10/m)
- road user cost (\$0.28/m)
- removal cost (not appropriate in this example)

$$S = 3.53$$

$$\text{BBF} = (R_u T_s) / S = (204)(4)/3.53 = 231$$

It is evident that the BBF (the units of which are mcd-years per dollar-meter) is not a constant and will change in relation to the anticipated service life of the project. A material that may be capable of lasting 5 years in a given environment will only be credited for 3 years of life on a project expected to last 3 years while the costs will remain the same. This makes the BBF responsive to project life, material performance, and cost.

Responsibilities:

The Bureau of Traffic Engineering and Materials & Research will maintain histories of test projects and update retroreflectivity data per material type yearly.

The Bureau of Construction and Maintenance will provide updated cost information to the Bureau of Traffic Engineering on a yearly basis.

The Bureau of Traffic Engineering will update the BBF tables, given the cost and service life data provided above. The BBF tables will be updated on a yearly basis.

APPENDIX C: PAVEMENT MARKING DESIGN STANDARDS

General:

Pavement markings shall be placed in accordance with guidance provided in the *Manual on Uniform Traffic Control Devices*. Cities and/or consultants preparing plans for Kansas state highway system projects should consult with the Bureau of Traffic Engineering regarding pavement marking material options while the project is in its conceptual stages. Final selection of materials will take place at the time of the field check.

The Pavement Marking Plans shall be separate from Project Plan Sheets and will contain only that geometric detail necessary to locate or relate pavement markings to physical conditions present on the site.

KDOT Pavement Marking Line Standards		
Line Type	Width	Color
Center Line *	100 mm	Yellow
Edge Line	100 mm	Yellow or White
Broken Lane Line**	150 mm	White
Solid Lane Line**	150 mm	White
Gore Markings	200 mm	White
Diagonals & Chevrons ***	300 mm	Yellow or White
STOP Line	600 mm	White
Crosswalk:		
Type I	300 mm	White
Type II	600 mm	White

- * Double yellow centerlines will be separated by a 100-mm space.
- ** Lane line markings, if applied by KDOT maintenance forces, may be applied at a width of 100 mm.
- *** Shall be inclined at 30° and spaced at a distance in meters equal to the speed in km/h divided by 5.

The **Line Segment/Gap Pattern** for lane lines and dashed centerlines will consist of a 2.5-m line segment followed by a 7.5-m gap if the markings will be maintained by KDOT. If the markings are not to be maintained by KDOT, the local standard may be used if not in violation of the *Manual on Uniform Traffic Control Devices*. Dotted extension lines will follow a 0.6 m/1.2 m line segment/gap pattern.

Bid Items:

Pavement markings are bid per meter for each pavement marking material type, color, and width for longitudinal and transverse lines. Symbols are bid per "Each". Pavement marking removal is bid per meter. KDOT Standard Sheet **TE310SI**, entitled *Summary and Recapitulation of Pavement Marking Quantities (Plastic and Epoxy)*, covers the following bid items:

Pavement Marking (Patterned Cold Plastic) (*) (+)
Pavement Marking Symbol (Patterned Cold Plastic) (White) (**)

Pavement Marking (High Durability) (*) (+)
Pavement Marking (High Durability) (White) (**)

Pavement Marking (Epoxy) (*) (+)
Pavement Marking Removal

- * White or Yellow
- + Width
- ** Type (LT Arrow, RT Arrow, ONLY, etc.)

KDOT Standard Sheet **TE311SI**, entitled *Summary and Recapitulation of Pavement Marking Quantities (Thermoplastics and Epoxy)*, covers the following bid items:

Pavement Marking (Thermoplastic) (*) (+)

Pavement Marking (Thermoplastic) (Special) (*) (+)

Pavement Marking (Spray Thermoplastic) (*) (+)

Pavement Marking (Preformed Thermoplastic) (*) (+)
Pavement Marking Symbol (Preformed Thermoplastic) (White) (**)

Pavement Marking (Epoxy) (*) (+)

- * White or Yellow
- + Width
- ** Type (LT Arrow, RT Arrow, ONLY, etc.)

Removal of Pavement Markings:

Where the existing pavement markings conflict with the new markings, they shall be removed in accordance with guidance provided in Section 822 of the *Standard Specifications for State Road and Bridge Construction - Metric Version (1990)*.

The bid item is: Pavement Marking Removal, which is measured in meters.

Availability of KDOT Standards:

On September 22, 1995 the Chief of Design sent letters to all consultants informing them how to obtain standard sheets via INK, a system which allows standards to be transferred electronically. If the designer does not have this capability, they may order mylar copies from the KDOT Bureau of Design Plans Vault, (785) 296-3066. In requesting standard sheets, please refer to the standard number and name. Standards are available only in SI units.

APPENDIX D: BRIGHTNESS BENEFIT FACTORS FOR LONG LINES

New or existing surface, Service Life Remaining >7 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	241	326	273
Thermoplastic *	780	593	587
Spray Thermoplastic *	357	0	0
Epoxy	752	399	250
KDOT Paint (HD-21)	369	343	310
Modified Urethane	691	508	495
Cementitious	154	149	131
PCP CL & Epoxy EL	696	391	252

New or existing surface, Service Life Remaining 7 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	241	326	273
Thermoplastic *	780	593	587
Spray Thermoplastic *	357	0	0
Epoxy	752	399	250
KDOT Paint (HD-21)	369	343	310
Modified Urethane	691	508	495
Cementitious	140	136	120
PCP CL & Epoxy EL	696	391	252

New or existing surface, Service Life Remaining 6 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	241	326	273
Thermoplastic *	780	593	587
Spray Thermoplastic *	357	0	0
Epoxy	752	399	250
KDOT Paint (HD-21)	369	343	310
Modified Urethane	691	508	495
Cementitious	129	125	111
PCP CL & Epoxy EL	696	391	252

New or existing surface, Service Life Remaining 5 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	201	326	273
Thermoplastic *	717	593	587
Spray Thermoplastic *	357	0	0
Epoxy	752	399	250
KDOT Paint (HD-21)	369	343	310
Modified Urethane	787	508	495
Cementitious	115	112	99
PCP CL & Epoxy EL	691	391	252

*Not to be used on concrete surfaces.

New or existing surface, Service Life Remaining 4 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	161	261	218
Thermoplastic *	607	576	570
Spray Thermoplastic *	357	0	0
Epoxy	781	399	250
KDOT Paint (HD-21)	369	343	310
Modified Urethane	737	579	562
Cementitious	98	95	84
PCP CL & Epoxy EL	712	383	246

New or existing surface, Service Life Remaining 3 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	121	196	164
Thermoplastic *	482	500	495
Spray Thermoplastic *	357	0	0
Epoxy	675	372	187
KDOT Paint (HD-21)	369	343	310
Modified Urethane	608	514	499
Cementitious	78	76	67
PCP CL & Epoxy EL	613	353	185

New or existing surface, Service Life Remaining 2 years

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	80	131	109
Thermoplastic *	351	363	359
Spray Thermoplastic *	357	0	0
Epoxy	470	297	164
KDOT Paint (HD-21)	369	343	310
Modified Urethane	433	389	378
Cementitious	52	51	45
PCP CL & Epoxy EL	427	278	158

New or existing surface, Service Life Remaining \leq 1 year

Material Type	Brightness Benefit Factor for ADT of:		
	<5000	5000-50000	>50000
Patterned Cold Plastic	40	65	55
Thermoplastic *	183	187	185
Spray Thermoplastic *	179	0	0
Epoxy	243	172	102
KDOT Paint (HD-21)	369	343	310
Modified Urethane	226	217	211
Cementitious	26	25	22
PCP CL & Epoxy EL	220	160	97

* Not to be used on concrete surfaces.

APPENDIX E: EXPECTED PAVEMENT SURFACE LIVES

MAJOR MODIFICATION CATEGORIES:

New Concrete:	20-30 years
New Asphalt Construction	10 years

SUBSTANTIAL MAINTENANCE CATEGORIES:

Cold In-Place Recycle/20-40 mm Overlay:	3-7 years
Modified Slurry Seal (Micro-surfacing)	3-4 years
40mm Mill & 40 mm Overlay:	4-7 years
Cold In-Place Recycle/Conventional Seal:	3-5 years
40mm Straight Overlay, No Milling:	3-7 years
Conventional Seal:	2-4 years
Milling (for Rutting):	1-2 years

**APPENDIX F: KANSAS DEPARTMENT OF TRANSPORTATION
PAVEMENT MARKING MAINTENANCE POLICY**

PURPOSE:

This policy provides guidance in the assignment of responsibilities for the repair, maintenance, and replacement of pavement markings installed on the Kansas state highway system. The following are the options that KDOT will employ when determining what action should be taken.

1) Restriping by Contract:

Roadway surfaces that are concrete pavement or are within urban areas, that have an expected service life of four (4) or more should be restriped by contract. After the preceding criteria has been met then District will generate a form 402 reflecting the type and quantities of pavement marking materials required. Funding will derive from the Pavement Marking Set-Aside Program. 402 forms will be transmitted to the Bureau of Construction and Maintenance by June 1.

If there are any questions or concerns regarding material selection, contact the Bureau of Traffic Engineering at (785) 296-3618 for assistance.

2) Re-striping by District Maintenance Forces:

If the expected life of the pavement surface is less than four years, or the surface is asphalt, in a rural area, and the retroreflectivity is inadequate, then the roadway will be painted by District forces.

3) Do Nothing:

If the expected life of the pavement surface is less than one year and if a long-life marking material is exhibiting good daytime appearance and adequate retroreflectivity, no action is necessary prior to the next overlay cycle.